NOTE ON RELATIVE CAPACITIES OF SOLUTIONS OBTAINED FROM FOREST VEGETATION FOR MOBILIZATION OF IRON

In a recent communication from this laboratory (4) it was shown that natural rainfall leachates from decomposing leaves had the capacity to mobilize iron and aluminium. Aqueous extracts obtained in the laboratory from the leaves and from the bark of trees also have been shown to possess this property (1). During the past year we have found that the solutions formed when rainfall penetrates the living forest canopy also show this characteristic.

The purpose of this note is to present comparative data on the iron-mobilization capacities of laboratory-prepared leaf extracts, of natural rainfall leachates from decomposing leaves and from A horizons of podzol soils, and of solutions dripping from the forest canopy during rainfall.

Leaf extracts were prepared by shaking 10 gm. of leaf powder obtained from air-dried leaves of the autumnal leaf-fall with 100 ml. distilled water for one hour, filtering and washing with water to a volume of 140 ml. Leachates were collected in the field as described previously (3, 4). Canopy drip solutions were obtained using the same type of equipment as for the leachates. The plant species studied were maple (Acer saccharum Marsh.) growing on a brown forest soil, beech (Fagus grandifolia Ehrh.), poplar (Populus grandidentata) and pine (Pinus strobus), the beech growing on a well-drained podzol and the poplar and pine on an imperfectly drained podzol. The A horizon materials consisted of rectangular blocks, including the A_{00} and A_0 layers and the A_2 horizon, collected under beech and under pine, cut to the dimensions of the leaching trays and fitted as snugly as possible into the latter. All the leachate and canopy drip solutions here reported upon were collected on May 22, 1954. The leaf extracts were prepared in the laboratory on the same date.

Assessment of iron-mobilizing power was made by placing 50 ml. of solution (extract, leachate or canopy drip), plus freshly-prepared, cold-precipitated ferric hydroxide gel equivalent to 66.6 mgm. of iron (Fe), in 500 ml. screw-capped bottles, adjusting the pH to approximately 5 by addition of dilute nitric acid or saturated calcium hydroxide solution, adding 10 drops of chloroform to inhibit biological action, and shaking in a horizontal position on a reciprocating shaker for 3 days, the bottles being rotated three times daily. On removal from the shaker the suspensions were centrifuged at 2000 r.p.m. for 10 minutes and aliquots of the supernatant taken for analysis. Ferric iron, and total iron after digestion with nitric and perchloric acids, were estimated in aliquots from the supernatant liquid using the thiocyanate method of Houlihan and Farina (2). The organic matter contents of the original solutions were estimated, after evaporation to dryness on the water-bath, by dichromate oxidation (5).

The data obtained for iron mobilized, that is, iron remaining in solution or suspension after shaking and centrifugation, are reported in Table 1.

TALBE 1.—IRON-MOBILIZATION CAPACITIES OF EXTRACTS, LEACHATES AND CANOPY DRIP-SOLUTIONS, EXPRESSED AS MILLIGRAMS IRON (FE) PER GRAM OF ORGANIC MATTER

Nature of Solution	Organic Matter mgm./50 ml.	Iron Mobilized	
		Total Iron	Ferric Iron
Maple extract	309	17	13
leachate	24	19	18
canopy drip	7	43	43
Poplar extract	361	14	12
leachate	8	48	47
Beech extract	204	13	10
A-horizon leachate	2	100	100
canopy drip	7	22	22
Pine extract	368	2	2
leachate	3	13	12
A-horizon leachate	5	11	11

We conclude, on the basis of such data as are shown in Table 1, and from consideration of the undoubted influences of the microflora and the fauna of the forest floor on the nature of solutions penetrating into the soil, that conclusions respecting the mobilization of iron in soil genesis under virgin conditions will require collection for study of solutions obtained beneath the forest canopy and from materials decomposing under as natural conditions as possible.

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